manual de fórmulas técnicas

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- Manual electrónico con fórmulas prediseñadas
- Potente editor de fórmulas
- Función de graficado

Alfaomega

Superficies

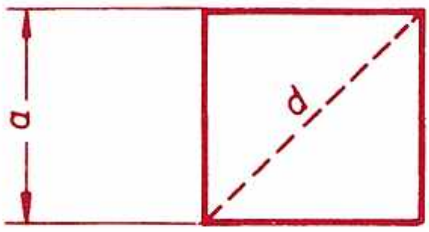
B 1

Cuadrado

b 1 $A = a^2$

b 2 $a = \sqrt{A}$

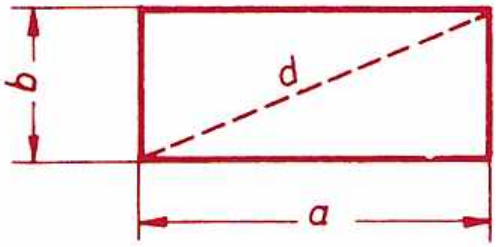
b 3 $d = a\sqrt{2}$



Rectángulo

b 4 $A = a\,b$

b 5 $d = \sqrt{a^2 + b^2}$

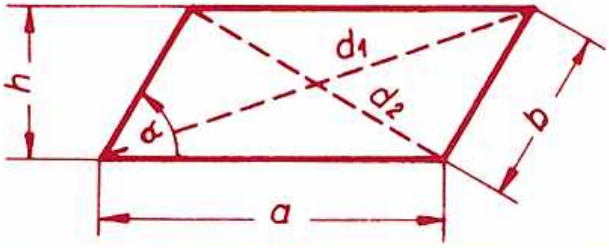


Paralelogramo

b 6 $A = a\,h = a\,b \operatorname{sen} \alpha$

b 7 $d_1 = \sqrt{(a + h \cot \alpha)^2 + h^2}$

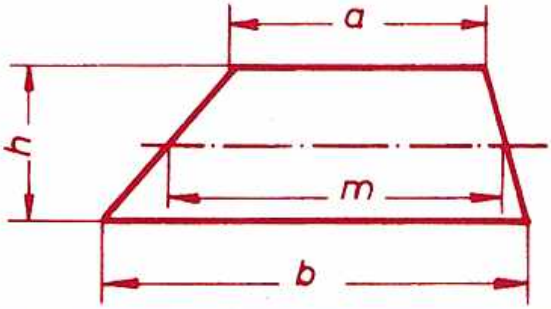
b 8 $d_2 = \sqrt{(a - h \cot \alpha)^2 + h^2}$



Trapecio

b 9 $A = \dfrac{a + b}{2} h = m\,h$

b 10 $m = \dfrac{a + b}{2}$

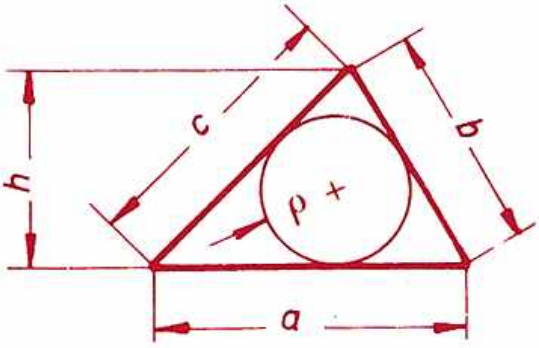


Triángulo

b 11 $A = \dfrac{a\,h}{2} = \rho\,s$

b 12 $= \sqrt{s(s-a)(s-b)(s-c)}$

b 13 $s = \dfrac{a + b + c}{2}$



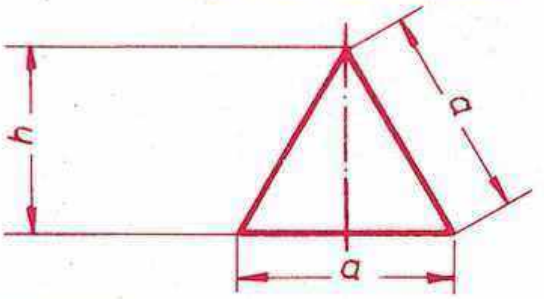
Superficies

B 2

Triángulo equilátero

b 14 $A = \frac{a^2}{4}\sqrt{3}$

b 15 $h = \frac{a}{2}\sqrt{3}$



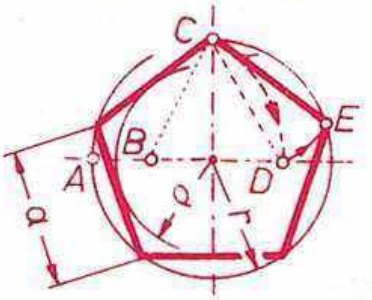
Pentágono regular

b 16 $A = \frac{5}{8} r^2 \sqrt{10 + 2\sqrt{5}}$

b 17 $a = \frac{1}{2} r \sqrt{10 - 2\sqrt{5}}$

b 18 $\rho = \frac{1}{4} r \sqrt{6 + 2\sqrt{5}}$

Construcción:
$AB = 0.5\,r$, $BC = BD$, $CD = CE$



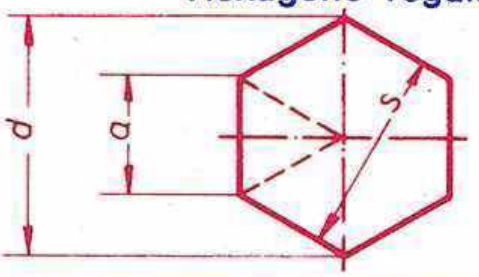
Hexágono regular

b 19 $A = \frac{3}{2} a^2 \sqrt{3}$

b 20 $d = 2\,a$

b 21 $= \frac{2}{\sqrt{3}} s \cong 1.155\,s$

b 22 $s = \frac{\sqrt{3}}{2} d \cong 0.866\,d$



Octágono regular

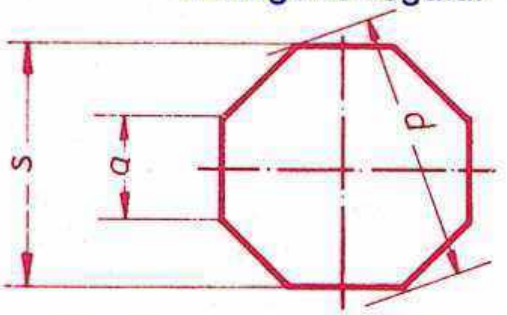
b 23 $A = 2\,a\,s \cong 0.83\,s^2$

b 24 $= 2\,s\sqrt{d^2 - s^2}$

b 25 $a = s \tan 22.5° \cong 0.415\,s$

b 26 $s = d \cos 22.5° \cong 0.924\,d$

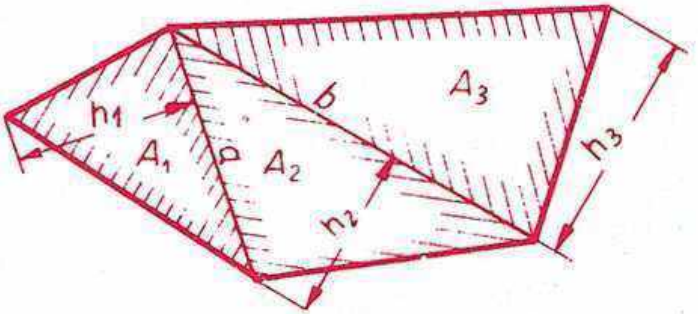
b 27 $d = \frac{s}{\cos 22.5°} \cong 1.083\,s$



Polígono

b 28 $A = A_1 + A_2 + A_3$

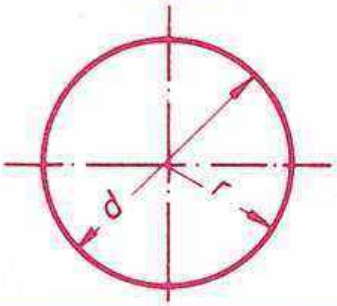
b 29 $= \frac{a\,h_1 + b\,h_2 + b\,h_3}{2}$



Superficies

B 3

Círculo

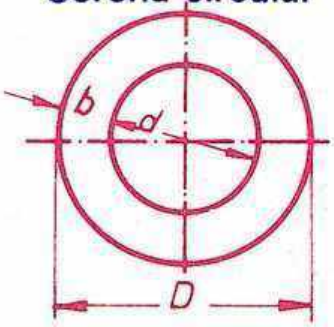


b 30 $A = \frac{\pi}{4} d^2 = \pi r^2$

b 31 $\cong 0.785\, d^2$

b 32 $P = 2\pi r = \pi d$

Corona circular

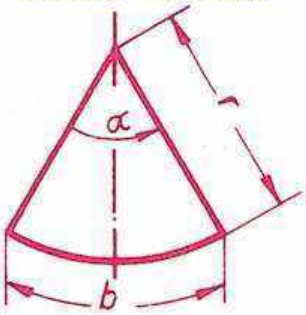


b 33 $A = \frac{\pi}{4}(D^2 - d^2)$

b 34 $= \pi (d + b)\, b$

b 35 $b = \frac{D - d}{2}$

Sector circular



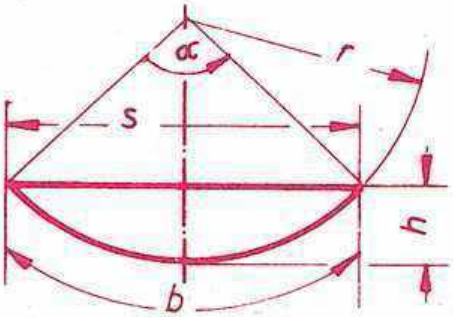
b 36 $A = \frac{\pi}{360} r^2 \alpha = \frac{\hat{\alpha}}{2} r^2$

b 37 $= \frac{br}{2}$

b 38 $b = \frac{\pi}{180} r \alpha$

b 39 $\hat{\alpha} = \frac{\pi}{180} \alpha$ ($\hat{\alpha} = \alpha$ en radianes)

Segmento circular



b 40 $s = 2r \operatorname{sen} \frac{\alpha}{2}$

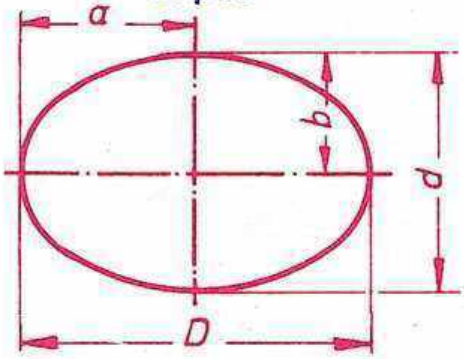
b 41 $A = \frac{h}{6s}(3h^2 + 4s^2) = \frac{r^2}{2}(\hat{\alpha} - \operatorname{sen} \alpha)$

b 42 $r = \frac{h}{2} + \frac{s^2}{8h}$

b 43 $h = r(1 - \cos \frac{\alpha}{2}) = \frac{s}{2} \tan \frac{\alpha}{4}$

b 44 $\hat{\alpha}$: Ver fórmula b 39.

Elipse



b 45 $A = \frac{\pi}{4} D\, d = \pi\, a\, b$

b 46 $P \cong \pi \frac{D + d}{2}$

b 47 $= \pi (a + b) [1 + \frac{1}{4}\lambda^2 + \frac{1}{64}\lambda^4 + \frac{1}{256}\lambda^6 + \frac{25}{16\,384}\lambda^8 + \ldots]$, donde $\lambda = \frac{a - b}{a + b}$

Cuerpos

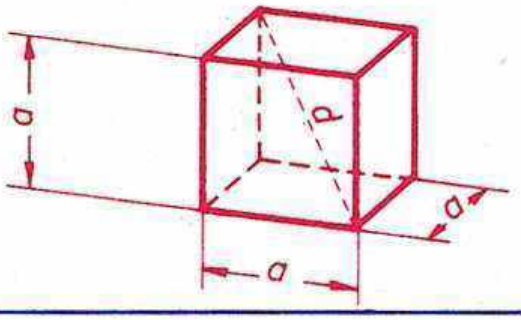
C 1

Cubo

c 1 $V = a^3$

c 2 $A = 6\,a^2$

c 3 $d = \sqrt{3}\,a$

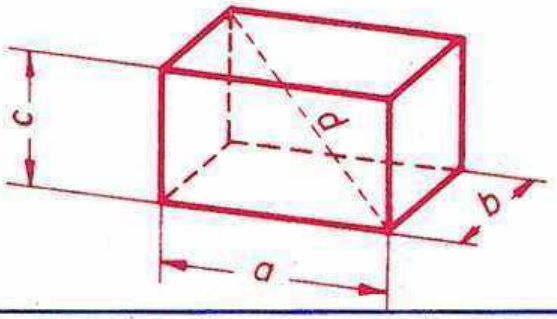


Prisma rectangular (recto)

c 4 $V = a\,b\,c$

c 5 $A = 2(a\,b + a\,c + b\,c)$

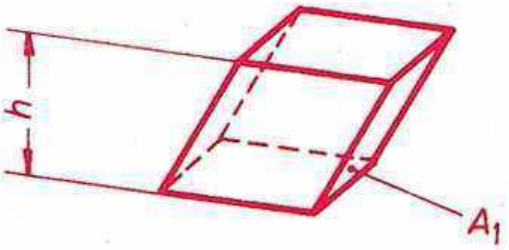
c 6 $d = \sqrt{a^2 + b^2 + c^2}$



Prisma oblicuo

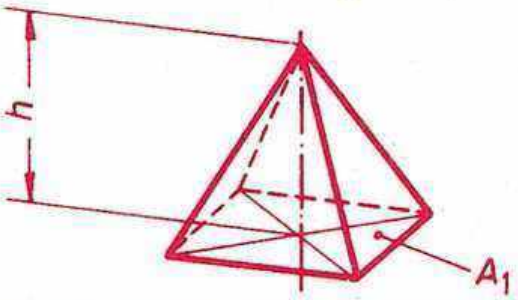
c 7 $V = A_1\,h$

(Principio de Cavalieri)



Pirámide rectangular (recta)

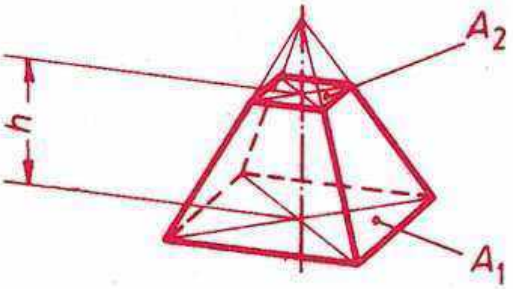
c 8 $V = \dfrac{A_1\,h}{3}$



Pirámide truncada

c 9 $V = \dfrac{h}{3}\,(A_1 + A_2 + \sqrt{A_1\,A_2})$

c 10 $\cong h\,\dfrac{A_1 + A_2}{2}$



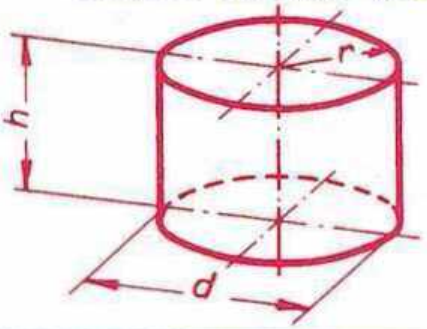
Cuerpos

Cilindro circular (recto)

c 11 $V = \frac{\pi}{4} d^2 h$

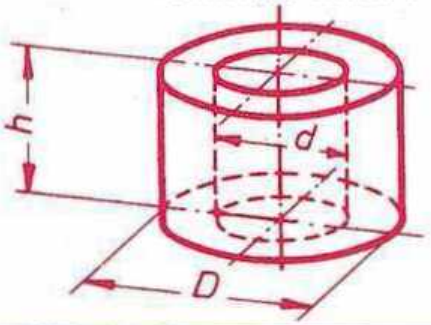
c 12 $A_l = 2 \pi r h$

c 13 $A_t = 2 \pi r (r + h)$



Cilindro hueco

c 14 $V = \frac{\pi}{4} h (D^2 - d^2)$



Cono circular (recto)

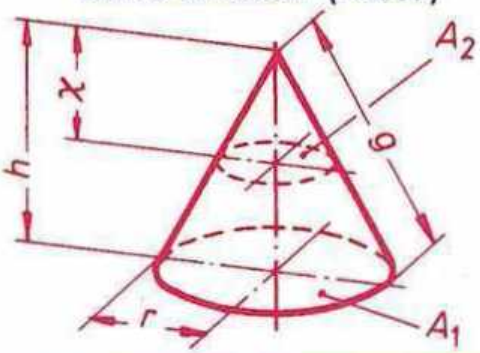
c 15 $V = \frac{\pi}{3} r^2 h$

c 16 $A_l = \pi r g$

c 17 $A_t = \pi r (r + g)$

c 18 $g = \sqrt{h^2 + r^2}$

c 19 $A_2 : A_1 = x^2 : h^2$

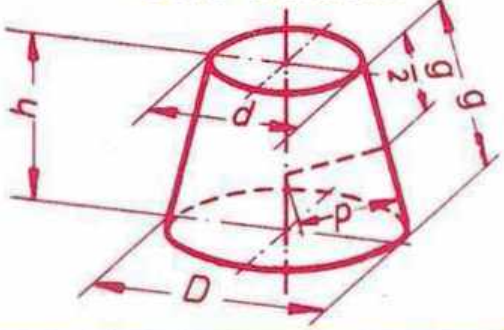


Cono truncado

c 20 $V = \frac{\pi}{12} h (D^2 + Dd + d^2)$

c 21 $A_l = \frac{\pi}{2} g (D + d) = 2 \pi p h$

c 22 $g = \sqrt{[(D - d)/2]^2 + h^2}$

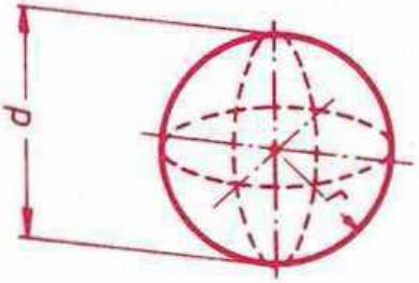


Esfera

c 23 $V = \frac{4}{3} \pi r^3 = \frac{1}{6} \pi d^3$

c 24 $\cong 4.189\, r^3$

c 25 $A = 4 \pi r^2 = \pi d^2$



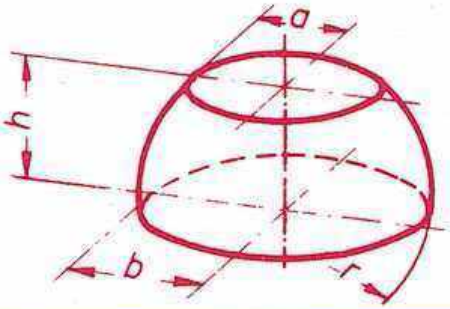
Cuerpos

Segmento esférico truncado

c 26 $V = \frac{\pi}{6} h (3a^2 + 3b^2 + h^2)$

c 27 $A_i = 2\pi r h$ (Zona esférica)

c 28 $A_t = \pi (2 r h + a^2 + b^2)$



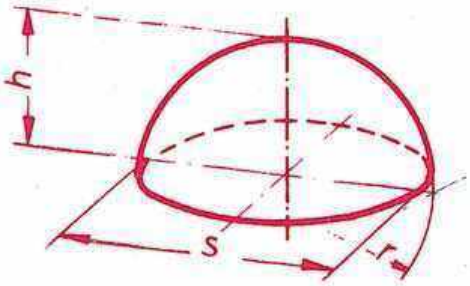
Segmento esférico

c 29 $V = \frac{\pi}{6} h (\frac{3}{4} s^2 + h^2)$

$= \pi h^2 (r - \frac{h}{3})$

c 30 $A_i = 2\pi r h$ (Casquete esférico)

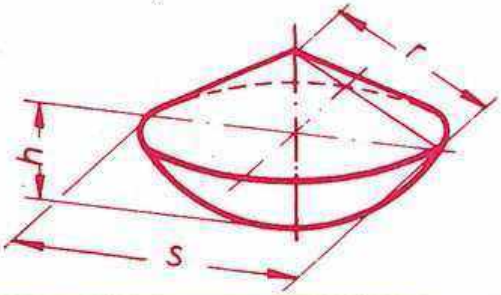
c 31 $= \frac{\pi}{4} (s^2 + 4h^2)$



Sector esférico

c 32 $V = \frac{2}{3} \pi r^2 h$

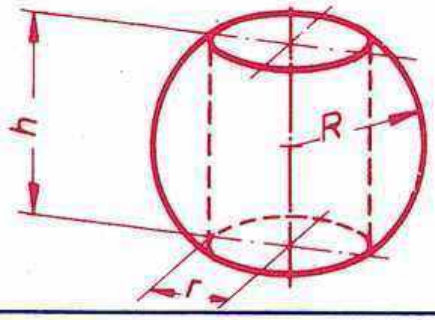
c 33 $A_t = \frac{\pi}{2} r (4h + s)$



Esfera con perforación cilíndrica

c 34 $V = \frac{\pi}{6} h^3$

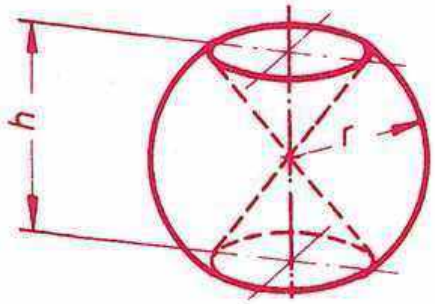
c 35 $A_t = 2\pi h (R + r)$



Esfera con perforaciones cónicas

c 36 $V = \frac{2}{3} \pi r^2 h$

c 37 $A_t = 2\pi r \left(h + \sqrt{r^2 - h^2/4}\right)$



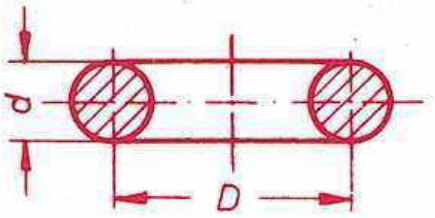
Cuerpos

C 4

Toro
(anillo de sección circular)

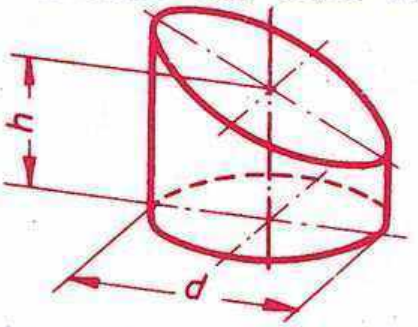
c 38 $V = \frac{\pi^2}{4} D\, d^2$

c 39 $A = \pi^2 D\, d$



Cilindro con corte inclinado

c 40 $V = \frac{\pi}{4} d^2 h$

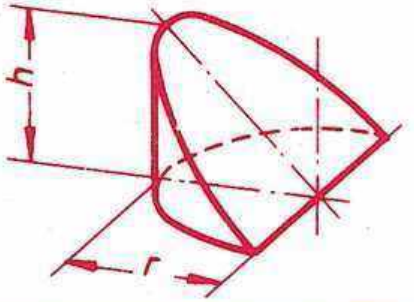


Cuña cilíndrica

c 41 $V = \frac{2}{3} r^2 h$

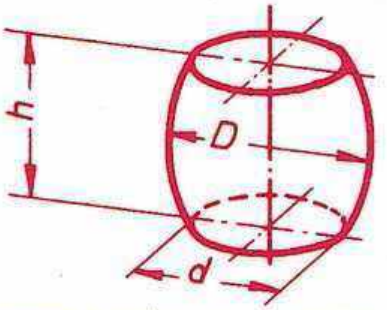
c 42 $A_l = 2\, r\, h$

c 43 $A_t = A_l + \frac{\pi}{2} r^2 + \frac{\pi}{2} r \sqrt{r^2 + h^2}$



Barril

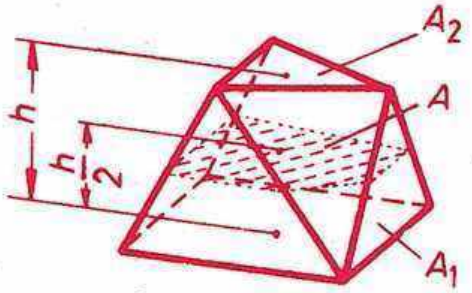
c 44 $V \cong \frac{\pi}{12} h\, (2\, D^2 + d^2)$



Prismatoide

c 45 $V = \frac{h}{6} (A_1 + A_2 + 4\, A)$

Esta fórmula se aplica también a los cuerpos de las partes C1 a C3, incluso para la esfera y sus porciones.



Estática

Centroides

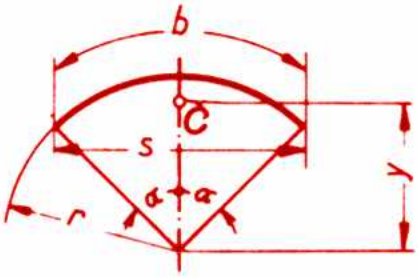
Arco de circunferencia

k 28 $$y = \frac{r\,(\operatorname{sen}\alpha)\,(180°)}{\pi\,(\alpha°)} = \frac{r\,s}{b}$$

k 29 $y = 0.6366\,r$ si $2\alpha = 180°$

k 30 $y = 0.9003\,r$ si $2\alpha = 90°$

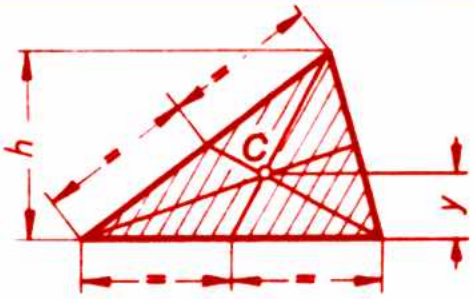
k 31 $y = 0.9549\,r$ si $2\alpha = 60°$



Triángulo

k 32 $$y = \frac{1}{3}\,h$$

C está en el punto de intersección de las medianas.



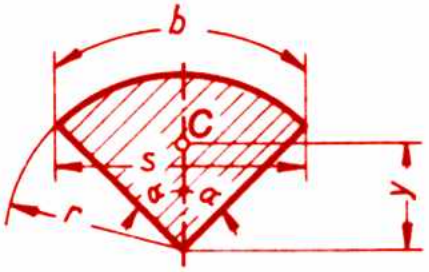
Sector de círculo

k 33 $$y = \frac{2r\,(\operatorname{sen}\alpha)\,(180°)}{3\,\pi\,(\alpha°)} = \frac{2r\,s}{3b}$$

k 34 $y = 0.4244\,r$ si $2\alpha = 180°$

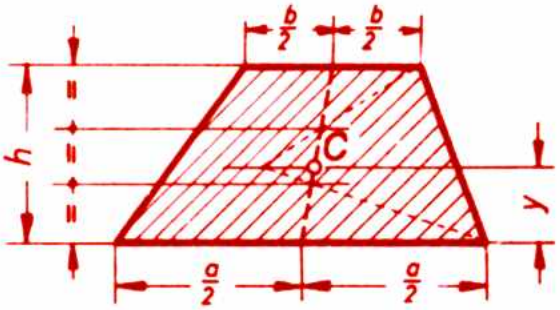
k 35 $y = 0.6002\,r$ si $2\alpha = 90°$

k 36 $y = 0.6366\,r$ si $2\alpha = 60°$



Trapecio

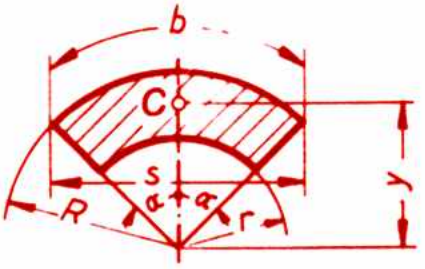
k 37 $$y = \frac{h}{3} \cdot \frac{a + 2b}{a + b}$$



Segmento de corona circular

k 38 $$y = \frac{2}{3} \cdot \frac{R^3 - r^3}{R^2 - r^2} \cdot \frac{\operatorname{sen}\alpha}{\alpha}$$

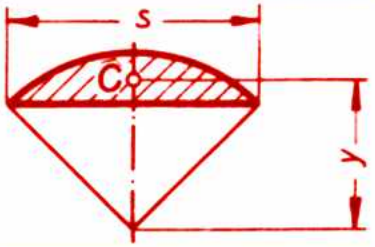
k 39 $$y = \frac{2}{3} \cdot \frac{R^3 - r^3}{R^2 - r^2} \cdot \frac{s}{b}$$



Segmento de círculo

k 40 $$y = \frac{s^3}{12\,A}$$

Para el área *A* véase B 3.

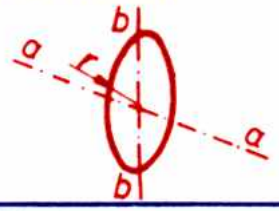
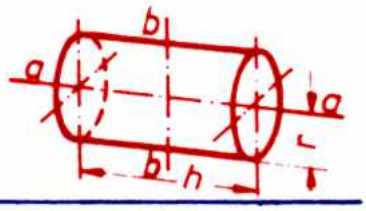
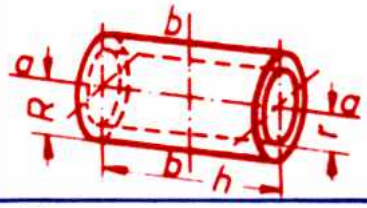
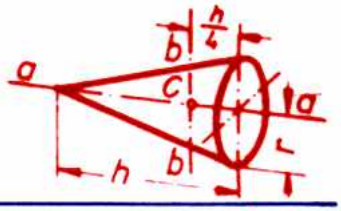
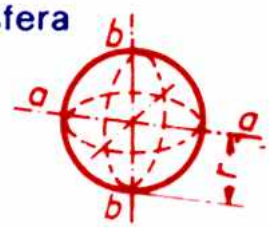
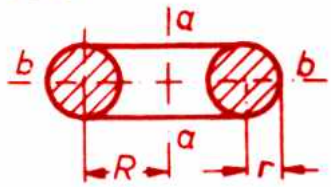
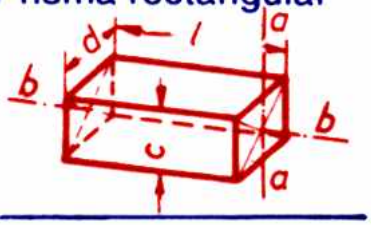


Para la determinación del centroide *C* (o *Cg*) véase también I 7

Dinámica

Momentos de inercia de masa

M 3

	Con respecto al eje *a-a* (de revolución)	Con respecto al eje *b-b* (que pasa por el centro de masa *C*)	Cuerpos
m 15	$J = m\,r^2$	$J = \frac{1}{2}\,m\,r^2$	Aro circular 
m 16	$d_i^2 = 4\,r^2$	$d_i^2 = 2\,r^2$	
m 17	$J = \frac{1}{2}\,m\,r^2$	$J = \frac{m}{12}\,(3\,r^2 + h^2)$	Cilindro 
m 18	$d_i^2 = 2\,r^2$	$d_i^2 = \frac{1}{3}\,(3\,r^2 + h^2)$	
m 19	$J = \frac{1}{2}\,m(R^2 + r^2)$	$J = \frac{m}{12}\,(3\,R^2 + 3\,r^2 + h^2)$	Cilindro hueco 
m 20	$d_i^2 = 2\,(R^2 + r^2)$	$d_i^2 = \frac{1}{3}\,(3\,R^2 + 3\,r^2 + h^2)$	
m 21	$J = \frac{3}{10}\,m\,r^2$	$J = \frac{3}{80}\,m(4\,r^2 + h^2)$	Cono 
m 22	$d_i^2 = \frac{6}{5}\,r^2$	$d_i^2 = \frac{3}{20}\,(4\,r^2 + h^2)$	
m 23	$J = \frac{4}{10}\,m\,r^2$	$J = \frac{4}{10}\,m\,r^2$	Esfera 
m 24	$d_i^2 = \frac{8}{5}\,r^2$	$d_i^2 = \frac{8}{5}\,r^2$	
m 25	$J = m(R^2 + \frac{3}{4}\,r^2)$	$J = m\,\frac{4\,R^2 + 5\,r^2}{8}$	Toro 
m 26	$d_i^2 = 4\,R^2 + 3\,r^2$	$d_i^2 = \frac{1}{2}\,(4\,R^2 + 5\,r^2)$	
m 27	$J = \frac{1}{12}\,m(d^2 + 4\,l^2)$*	$J = \frac{m}{12}\,(d^2 + c^2)$	Prisma rectangular 
m 28	$d_i^2 = \frac{4}{3}\,l^2$	$d_i^2 = \frac{1}{3}\,(d^2 + c^2)$	

*Si $d, c << l$, $J = (m/3)\,l^2$